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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/690,181	10/21/2003	Peter J. Hopper	100-23400 (P05711)	3935
33402	7590	06/23/2005	EXAMINER	
LAW OFFICES OF MARK C. PICKERING P.O. BOX 300 PETALUMA, CA 94953			ELLIS, SUEZU Y	
			ART UNIT	PAPER NUMBER
			2878	

DATE MAILED: 06/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/690,181

Applicant(s)

HOPPER ET AL.

Examiner

Suezu Ellis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 14-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5 and 7-13 is/are rejected.
- 7) ☒ Claim(s) 4 and 6 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election without traverse of Group I of claims 1-13 in the reply filed on June 2, 2005 is acknowledged.

### ***Information Disclosure Statement***

The information disclosure statement (IDS) submitted on August 10, 2004 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

### ***Drawings***

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: Reference number 339 is missing, as described in pg. 4, line 23 and pg. 9, line 11.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the hole having an L-shape (claim 9) must be shown or the feature canceled from the claim. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures

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appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 9-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to claims 9 and 12, it is unclear as to a tip end of the tip of the outer metal shell is spaced apart from the first end of the conductive center electrode to form a gap in between. Does the applicant mean there is a second

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electrode from the outer metal shell that has a tip? For examining purposes, that portion of claim will be treated as the outer metal shell has a second electrode with a tip where the tip end is spaced apart from the first end of a first conductive electrode to form a gap in between. Further, the claim recites the limitation "the conductive center electrode" in lines 5 and 7. Further, the claim recites the limitation "the channel" in line 3. There is insufficient antecedent basis for these limitations in the claim.

With respect to claim 10, it is unclear as to how the hole has an L-shape. Does the applicant mean the channel forms and L-shape or the shape of the hole itself is an L-shape. If the hole is an L-shape, applicant needs to illustrate it in the drawings, as addressed above. For examining purposes, the claim will be treated as the channel forms an L-shape.

With respect to claim 11, it is unclear as to how a hole is substantially straight. Does the applicant mean the channel is substantially straight? For examining purposes the claim will be treated as the channel being substantially straight.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Ingham (US 6,204,594).

With respect to claim 1, Ingham shows in Fig. 1C and 1E, a spark plug comprising an insulating core (130) with a central bore (173) which extends longitudinally throughout the insulating core and an outer shell (110) that fits around the insulating core.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Linder et al. (US 4,489,596). Hereinafter, Linder et al. will be referred to as Linder.

With respect to claim 1, Linder shows in Figs. 1-3, a spark plug with sensors comprising an insulator (15) with a longitudinal opening (36) which extends through the insulator and a metal housing (11) that surrounds the insulator.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Müller et al. (US 4,393,687) in view of Linder. Hereinafter, Müller et al. will be referred to as Müller.

With respect to claims 1, 2 and 8, Müller illustrates in Fig. 1, a sensor comprising an insulator (10b) with a longitudinal opening that creates a channel and extends through the insulator and a housing that surrounds the insulator. Müller further discloses an imaging structure (light guide 15, and evaluation circuit 312) that extends from the opening. Müller fails to expressly disclose the housing being made of metal. Müller and Linder are directed to a similar field of endeavor of sensors for combustion chambers. Linder discloses it is well known in spark plug technology for the housing to be made of metal. It would have been obvious to a person of ordinary skill in the art to create the housing of Müller with the materials of Linder to facilitate in the ease and cost effectiveness of the manufacturing process.

With respect to claim 3, the modified Müller discloses an evaluation unit (imager) with photodiodes (313a, 313b). Since photodiodes collect information about light and photons are wave-particles of light, inherently, the photodiodes collect photon information. Fig. 2 demonstrate a plurality of light guide fibers (15) that carry the photon information to the evaluation unit and extend out of the hole.

With respect to claim 7, the modified Müller fails to disclose the imager including a black and white imaging cell, however, it would have been an obvious design choice to modify the imager of Müller to include a black and white imaging

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cell in order to display the intensities of the light at a lower cost compared to a color imaging cell.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Müller in view of Linder and further in view of Extance et al. (US 4,919,099).

Hereinafter, Extance et al. will be referred to as Extance.

With respect to claim 5, the modified Müller addresses all the limitations of claims 1-3, however fails to expressly disclose the imager (evaluation unit) including a color imaging cell. Extance and Müller are directed to a similar field of endeavor of apparatus for monitoring combustion. Extance discloses an apparatus for monitoring combustion within an internal combustion engine comprising a probe connected via an optical fiber bundle to an optical transducer assembly wherein the transducer assembly is a color sensor comprising of photodiodes. It would have been an obvious design choice to a person of ordinary skill in the art to modify the imager of Müller to include a color imaging cell in order to display all the intensities of the spectral radiation.

Claims 1-3, 7, 8 and 11 are rejected 35 U.S.C. 103(a) as being unpatentable over Durling (US 6,359,377).

With respect to claims 1-3, 8 and 11, Durling discloses in Fig. 1 a spark plug comprising an insulating body (14) with a longitudinal opening which extends through the insulating body and a metal shell (36) surrounding an insulating body. Fig. 1 illustrates an imager (fiber optic pressure transducer - 24)



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located in a channel (passage - 16) within the insulating body. Fig. 1 further illustrates the passage is substantially straight and the middle region is wider than the end region. Durling further discloses the transducer collects photon information (light on the basis of total internal reflection of the fiber) and carries the photon information out of the transducer via an optical cable (col. 3, lines 33-44). Although Durling fails to expressly disclose the optical cable comprising a plurality of wires, it is well known that an optical cable can comprise of a plurality of optical fibers. Thus it would have been an obvious design choice to a person of ordinary skill in the art to include multiple optical fiber cables in order to carry more photon information from the transducer.

With respect to claim 7, the modified Durling fails to disclose the transducer including a black and white imaging cell, however, it would have been an obvious design choice to modify the transducer of Durling to include a black and white imaging cell in order to display the intensities of the light at a lower cost compared to a color imaging cell.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Durling in view of Extance.

With respect to claim 5, the modified Durling addresses all the limitations of claims 1-3, however fails to expressly disclose the transducer including a color imaging cell. Extance and Durling are directed to a similar field of endeavor of apparatus for monitoring combustion. Extance discloses an apparatus for monitoring combustion within an internal combustion engine comprising a probe

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connected via an optical fiber bundle to an optical transducer assembly wherein the transducer assembly is a color sensor comprising of photodiodes. It would have been an obvious design choice to a person of ordinary skill in the art to modify the imager of Müller to include a color imaging cell in order to display all the intensities of the spectral radiation.

Claims 1, 2, 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ingham in view of Durling.

With respect to claims 1 and 2, Ingham shows in Fig. 1C and 1E, a spark plug comprising an outer shell (110) that fits around an insulating core and the outer shell having a bore (166) that longitudinally extends through a portion of the outer shell, wherein a wire connected to the sensor extends from the opening to a gauge or indicating means (imaging structure) (col. 2, lines 17-19). Fig. 1 illustrates a channel (183) that extends longitudinally through the insulating core. Ingham fails to expressly disclose the opening formed longitudinally through the insulating jacket wherein an imaging structure is disposed. Ingham and Durling are directed to a similar field of endeavor of spark plugs. Durling discloses in Fig. 1, it is well known in the art for a sensor (24) to be placed through a hole (18) of the insulator (14). Thus it would have been an obvious design choice to a person of ordinary skill in the art to place the sensor in a hole within the insulator in order to facilitate in a more accurate pressure profile.

With respect to claim 10, the modified Ingham discloses the channel is at an angle less than 180°, thus can be an L-shape (col. 1, lines 51-52).

Claims 3, 9, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ingham in view of Durling and further in view of Extance.

With respect to claim 3, the modified Ingham addresses all the limitations of claims 1 and 2. The modified Ingham further discloses the sensor is connected to a monitoring unit where an output can be a display of pressure in the combustion cylinder, thus an imager is inherent (col. 1, lines 61-64). Ingham further discloses a wire leading out of the hole to a gauge or indicating means. However, the modified Ingham fails to expressly disclose the imager collects photon information and a plurality of wires that carry the photon information out of the hole. Extance discloses it is well known in the art for an apparatus that monitors combustion to include a transducer assembly comprising of photodiodes that are sensitive to radiation in infrared and visible wavelengths, thus collects photon information and an optical fiber bundle (plurality of optical fibers) carries the light to the transducer (col. 3, lines 53-57; col. 4, lines 3-11). It would have been an obvious design choice to a person of ordinary skill in the art to have a plurality of wires carry the electromagnetic radiation (photon information) to an imager which collects the radiation in order to recognize differences in the quality of the combustion from the norm, via light intensity signals collected from the photodiodes (col. 7, lines 38-40).

With respect to claim 9, the modified Ingham discloses a conductive electrode (having a first end (140) and second end (150) located in the channel and the outer metal shell has a second electrode with a tip (155) that curves

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directly above the first end of the conductive electrode, providing a gap in between the tip of the second electrode and the first end of the first electrode.

With respect to claim 12, the modified Ingham discloses the channel is at an angle less than 180°, thus can be an L-shape (col. 1, lines 51-52) and Fig. 1 illustrates the opening of the hole (120) is adjacent to the first end (140) of the conductive electrode.

With respect to claim 13, the modified Ingham discloses in Fig. 1A the hole has a first opening (115) and a second opening (120) that lie on opposite sides of an engine wall (Fig. 1A). Note although, the engine wall is not illustrated in the figure, it is known that the external threads (160) are for the purpose of installing the plug.

#### ***Allowable Subject Matter***

Claims 4 and 6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With respect to claim 4, prior art fails to teach or reasonably suggest, alone or in combination, a sensor comprising an imaging structure that includes a wiring substrate connected to an imager, in addition to the other limitations of the claim.

With respect to claim 6, prior art fails to teach or reasonably suggest, alone or in combination, a sensor comprising an imaging structure that includes a vertical color imaging cell.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Müller (US 4,422,321) discloses a combustion process sensor with a structure similar to a spark plug.


***Telephone/Fax Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Suez Ellis whose telephone number is 571-272-2868. The examiner can normally be reached on 8:30am-7pm (Monday-Thursday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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